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ORIGINAL ARTICLE

# Skin Cancer Incidence and Mortality in Spain: A Systematic Review and Meta-Analysis☆

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**KEYWORDS**
Basal cell carcinoma;
Squamous cell carcinoma;
Merkel cell carcinoma;
Epidemiology;
Mortality;
Incidence;
Review;
Meta-analysis

**Abstract**
*Introduction and objectives:* The aim of this systematic review was to describe the incidence and mortality of basal cell carcinoma, squamous cell carcinoma, melanoma, and Merkel cell carcinoma in Spain.
*Material and methods:* We performed a search of the MEDLINE and Embase databases and reviewed articles from the Spanish Network of Cancer Registries (REDECAN) and the International Agency for Research on Cancer (IARC). The methodological quality of the studies was evaluated and statistical heterogeneity was measured using the $I^2$ index. A random-effects model was used to perform the meta-analysis because of the heterogeneity of the data.
*Results:* Thirty-two papers were included in the systematic review. The crude incidence rate for basal cell carcinoma was 113.05 (95% CI, 89.03-137.08) cases per 100 000 person-years for the studies based on the registration methodology normally used by registries (in which only 1 tumor with histological confirmation is counted per person). However, the same incidence rate calculated on the basis of clinical and histologic criteria and counting tumors rather than individual patients was 253.23 (95% CI, 273.01-269.45) cases per 100 000 person-years. The incidence was 38.16 (95% CI, 31.72-39.97) cases per 100 000 person-years for squamous cell carcinoma, 8.76 (95% CI, 7.50-10.02) cases per 100 000 person-years for melanoma, and 0.28 (95% CI, 0.15-0.40) cases per 100 000 person-years for Merkel cell carcinoma.

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*Conclusions:* The registration methodology normally used by cancer registries probably underestimates the incidence rates of basal cell and squamous cell carcinoma in Spain. The incidence rates of cutaneous melanoma and Merkel cell carcinoma are lower in Spain than in other European countries.


**PALABRAS CLAVE**
Carcinoma de células basales;
Carcinoma de células escamosas;
Carcinoma de células de Merkel;
Epidemiología;
Mortalidad;
Incidencia;
Revisión;
Metaanálisis

## Incidencia y mortalidad del cáncer cutáneo en España: revisión sistemática y metaanálisis

### Resumen

*Introducción y objetivos:* El objetivo de la revisión sistemática es describir la incidencia y mortalidad en España del carcinoma basocelular, carcinoma espinocelular, melanoma y carcinoma de células de Merkel.

*Material y métodos:* Se realizó una búsqueda en Medline, Embase y revisión de artículos de la Red Española de Registros de Cáncer (REDECAN) y la Agencia Internacional de Investigación sobre el Cáncer (IARC). Se evaluó la calidad metodológica de los estudios. La heterogeneidad estadística se midió usando el estadístico $I^2$. Para el metaanálisis de los datos se empleó un modelo de efectos aleatorios debido a la heterogeneidad de los resultados.

*Resultados:* Se incluyeron un total de 32 trabajos en la revisión sistemática. La tasa de incidencia del carcinoma basocelular global cruda fue 113,05 (IC 95%: 89,03-137,08)/100.000 personas-año para los estudios que emplean la metodología de los registros de cáncer (contando un solo tumor por persona y diagnóstico histológico). La tasa de incidencia mediante criterios clínicos e histológicos, y contando tumores en lugar de personas, fue de 253,23 (IC 95%: 273,01-269,45)/100.000 personas-año. La incidencia de carcinoma espinocelular fue de 38,16 (IC 95%: 31,72-39,97)/100.000 personas-año, de 8,76 (IC 95%: 7,50-10,02)/100.000 personas-año para el melanoma y 0,28 (IC 95%: 0,15-0,40)/100.000 personas-año para el carcinoma de células de Merkel.

*Conclusiones:* La tasa de incidencia del carcinoma basocelular y espinocelular en España está probablemente infraestimada al utilizar el método habitual de los registros. La tasa de incidencia del melanoma cutáneo es baja en comparación con otros países europeos, al igual que la tasa de incidencia del carcinoma de células de Merkel.


## Introduction

Skin cancers are divided into 2 categories according to epidemiological and prognostic differences: cutaneous melanoma, and nonmelanoma skin cancer (NMSC). The 2 main types of NMSC are basal cell carcinoma (BCC) and squamous cell carcinoma (SCC).

The incidence of cutaneous melanoma continues to rise in Europe, with considerable geographical differences in mortality.[1,2] Owing to the higher incidence of NMSC compared to other skin tumors and the difficulty of quantifying the condition,[3] NMSC tumors are not consistently reported in cancer registries.

Both cutaneous melanoma and NMSC represent a significant economic burden to the Spanish National Health Service. Thus, it is essential to know the true burden of disease attributable to skin cancer in Spain.

The main objective of this systematic review is to describe the incidence and mortality of skin cancer in Spain, including cutaneous melanoma, BCC, SCC, and Merkel cell carcinoma.

## Material and Methods

### Criteria for Article Inclusion

#### Types of Studies

We reviewed all the epidemiological studies in the literature that assessed the incidence rate of skin cancer in Spain. To investigate the incidence of melanoma, we reviewed articles that included other forms of cancer, and particularly articles derived from data from population-based cancer registries in Spain.[4] For the other types of skin tumors, given the methodological difficulties involved in any assessment of the epidemiology of NMSC, we only reviewed articles that had as their main objective to describe the incidence of any form of NMSC.

Only articles referring to a Spanish population and reporting incidence rates and the corresponding CI (or providing sufficient data to calculate the CI) were finally included. We excluded studies of skin tumors in at risk populations (syndromes, immunocompromized patients, and other special populations, etc.), data on in situ tumors, and data from